

Spontan Subaraknoid Kanamanın Erken Dönem Tek Semptomu Olarak Akut Şiddetli Baş Ağrısı: Retrospektif Çalışma

Acute Severe Headache as The Sole Symptom of Early Spontaneous Subarachnoid Hemorrhage: A retrospective Study

✉ Aynur Yurtseven¹, ✉ Yahya Güvenç²

¹Diskapi Yıldırım Beyazıt Education and Training Hospital, Department of Emergency Medicine, Ankara, Turkey

²Marmara University, School of Medicine, Department of Neurosurgery, Istanbul, Turkey

ÖZ

Amaç: Bu çalışmanın amacı; sadece baş ağrısı şikayeti ile başvuran ve nörolojik muayenesi normal olup hayati tehlike teşkil eden subaraknoid kanamalı hastaları erken dönemde tanımlayıp tedavi başlayarak morbidite ve mortaliteyi azaltmaktır.

Metod: Bu çalışmaya Ocak 2012 ve Aralık 2013 tarihleri arasında acil servisimize son 24 saat içinde akut başlayan baş ağrısıyla başvuran ve normal nörolojik muayenesi olan 18362 hasta dahil edilmiştir. Çalışmamız retrospektif bir çalışmadır. Ağrının şiddeti visual analog scala (VAS) ya göre hastalar acil servise başvurdıklarında yapılmıştır. VAS skoru ≥ 7 üstünde olan 1424 hasta sekonder baş ağrısı olarak değerlendirilip ve bu hastalara kranial tomografi çekildi.

Bulgular ve Sonuçlar: Akut baş ağrısıyla acil servise başvuran hastalarda subaraknoid kanama insidansı 0.04% (n=8). Diğer patolojiler SVO 0.27% (n=57), intraparaknoidal hemoraji 0.09% (n=18), subdural kanama 0.03% (n=5), intrakranial kitle 0.06% (n=12) olarak görülmüştür.

Tartışma: Akut baş ağrısı tanısıyla acil servise başvuran hastalar dikkatli bir şekilde incelenmelidir. Hastada baş ağrısı tek semptom ve nörolojik muayene normal olmasına rağmen SAK gibi altta yatan ciddi patolojiler olabilir. Erken tanı ile morbidite ve mortalitesi yüksek olan bu hastalıkların önüne erken teşhis ve tedavi ile geçilebilir.

Anahtar Kelimeler: Baş ağrısı, subaraknoid kanama, erken semptom, retrospektif

ABSTRACT

Objective: The aim of this study was to emphasize that life-threatening subarachnoid hemorrhage (SAH) can be present in patients who present with headache and have normal neurological findings, to identify these patients at an early stage, and to contribute to decreased morbidity and mortality by increasing the number of patients who are treated.

Methods: A total of 18362 patients who presented to our emergency department (ED) between January 2012 and December 2013 with headache that had emerged within the past 24 hours and had normal neurological findings were included in the study. This was a retrospective study. The severity of the pain was queried during the examination and graded and recorded according to the visual analogue scale (VAS). A total of 1424 patients with a VAS score ≥ 7 where we considered a secondary headache underwent cranial computed tomography (CT).

Findings and Results: SAH incidence in patients presenting to the emergency service with acute headache was 0.04% (n=8). Other pathologies were CVO at 0.27% (n=57), intraparenchymal hemorrhage at 0.09% (n=18), subdural hematoma at 0.03% (n=5), and intracranial mass at 0.06% (n=12).

Conclusion: Patients presenting to the emergency service with acute headache should be examined carefully. There can be a serious underlying pathology such as SAH even when the neurological examination is normal and headache is the only symptom. Early diagnosis and treatment can prevent these with diseases with high morbidity and mortality

Key Words: Headache, subarachnoid hemorrhage, early symptom, retrospective

Sorumlu Yazar/Corresponding Author: Dr. Aynur Yurtseven
Diskapi Yıldırım Beyazıt Education and Training Hospital, Department
of Emergency Medicine, Ankara, Turkey

e.mail: aynuryurt7@gmail.com.tr

Tel: 05055630173

Geliş tarihi/Received: 02.02.2021
Kabul tarihi/Accepted: 24.03.2021

INTRODUCTION

It is well known that approximately half of the adult population suffers from headaches. The headaches are classified as primary, secondary, and cranial neuralgias and other headaches by the International Headache Society (IHS). Primary headaches are most common and carry a low risk. The most common primary headaches are tension-type headaches (40%), migraines (10%) and cluster type headaches (1%)(1). Secondary headaches carry a high risk and require physical examination and imaging to reveal the underlying pathology. The most common causes of secondary headaches are infectious and vascular diseases. Patients with headaches constitute 2-4% of the patients who present to an ED(2,3). The vast majority of such presentations are due to migraines and tension-type headaches(4,5). Secondary headaches account for about 5% of these patients. Subarachnoid bleeding accounts for 4-12% of patients who complain of severe headache(6). Headache is the major symptom of SAH and might be accompanied by vomiting, photophobia, neck stiffness, various levels of loss of consciousness and neurological deficits. It is difficult to rule out the diagnosis of SAH in patients with headache when the neurological examination is completely normal without any accompanying symptoms. Patients with SAH who present only with a symptom of headache might possibly be evaluated as a primary headache ending up with potentially catastrophic results. It is critical to differentiate patients with primary and secondary headache since the approach and treatment strategy is quite different. When using the IHS headache algorithm on patients who present with isolated headache, one should also focus on other information that may provide clues. All patients suspected of having SAH should be investigated with neuroimaging and, if necessary, lumbar puncture. The present study includes patients with spontaneous SAH who presented to the ED with headache as the sole symptom and normal neurological findings. This study aim is to help to identify SAH early, reduce diagnostic error and improve patient care.

MATERIAL AND METHODS

Study design and setting

The present study is a retrospective study over two years. The clinical local ethics committee approved form was taken from a local training and educational Hospital ethics committee and decision number is E15-464. Patients who presented to the Dışkapı Yıldırım Beyazıt Education and Training Hospital ED with acute headache between January 2012 and December 2013 were included in the study. The patients who were thought to have secondary headache were added to study when they were evaluated by physicians in this time interval. The other acute headache

patients data was recorded when they came to the ED and was included at the end of the study time.

The clinical history of the patients included into the study was evaluated and the neurological examination at the time of symptomatic period and on follow-up was recorded using the hospital information processing program named Nucleus (Monad, Ankara, Turkey). Following the analysis, the patients were recorded into the system using International Classification of Diseases-10 codes. The neurological and physical examinations were primarily performed by emergency physicians while some patients who were found to have a positive diagnosis were evaluated by a neurosurgeon.

All headaches were classified as primary, secondary or cranial neuralgia according to the IHS International Headache Classification (ICHD-2) criteria(6). In the patients files, there is a VAS score that is ready at the arrival examination. In general, the developmental pain score is questioned in patients who complain of all pain. The severity of the pain was evaluated, graded and recorded according to the visual analogue scale (VAS). In our study, patients who complained of headache and had a VAS score of 7 and above were included. Patients with chronic pain, mild severity and did not disturb the patient in their daily work, and the vas score was below 7 points, were not included in the study. A total of 1424 patients with a VAS score ≥ 7 were thought to be suffering from a secondary headache and underwent cranial CT. The amount of subarachnoid haemorrhage was classified on CT scans by Fisher Scale. The severity of SAH was evaluated by World Federation of Neurosurgical Societies (WFNS) grading system (Table 2). Patients with positive intracranial findings on cranial CT examination were hospitalized.

Study population

A total of 1,014,000 patients presented to the ED of our center between January 2012 and December 2013 and 18362 patients with acute headache were included into the study.

Inclusion and exclusion criteria

Patients whose headache had occurred within the past 24 hours and had normal neurological findings were included in the study. Patients with trauma, chronic headache or neurological deficit were excluded. Patients who had SAH and neurological deficit were excluded.

Statistical analysis

The data of all patients (18362 patients) was analyzed ac-

according to the patient's age, gender and CT results. Data analysis was performed with the aid of SPSS program (Windows 11.5 software). Discrete numerical variables were shown as mean \pm standard deviation and minimum – maximum. Normal variables were stated as frequency distribution by giving the number of cases and percentage values.

RESULTS

Acute headache was present in 18362 (1.8%) of the 1,014,000 patients that presented to our ED within the 2 years. All of the 18362 patients with acute headache were included into the study. Mean age was 46.6 ± 19.3 years. Females constitute 69.3% and males 30.3%.

The patients who had SAH with normal neurological examination had some symptoms. They stated that the headache had spread all over the head but had become more severe in the neck and some patients felt like they were being stabbed in the neck. Some patients also felt pressure as though their heads and having difficulty speaking because of the pain. The physical examination revealed a scared facial expression and restless mood.

Tomography scan was performed in 1434 (7.7%) patients who presented with acute headache. The incidence of any positive finding cranial CT was 7.8% while 92.2% of the investigations were reported to be normal. Table 1 demonstrates the rate of positive findings on cranial CT scan among all patients with acute headache. The number of SAH patients who presented to the ED with normal neurological examination was 8 (0,04%) in this study. There were 5 female and 3 male patients who presented with SAH. The age range of patients presenting with SAH was 18 to 89 years. The Fischer, VAS and WFNS scores of the SAH patients are presented in table 2. The CT images of the SAH patients are shown in figure 1. We started medical treatment for the patients diagnosed with SAH (8 patients) in our hospital and transferred them to the regional vascular surgery center and surgical clipping and endovascular coiling were performed. Other diagnosis recorded on cranial CT were cerebrovascular occlusion (CVO) in 53 patients (0.27%), intraparenchymal hemorrhage in 18 patients (0.09%), subdural hematoma in 5 patients (0.03%) and intracranial mass in 12 patients (0.06%).

Table 1. Frequency Distribution of CT Results in Acute Headache Patients Presenting to the Emergency Department (n=18362)

Pathologies	Patient Noun	%
SAH	8	0,04
CVO	53	0,27
Intraparenchymal Hemorrhage	18	0,09
Subdural Hematoma	5	0,03
Intracranial Mass	12	0,06

Table 2. The gender and age, Fisher, WFNS and VAS scores of the SAH patients

Patient	Sex	Age	Fischer	WFNS	VAS
1	F	18	2	1	10
2	M	25	3	1	9
3	M	35	3	1	9
4	M	36	3	1	10
5	F	64	3	1	8
6	F	74	3	1	9
7	F	86	4	1	10
8	F	89	4	1	9

F: Female; **M:** Male; **WFNS:** World Federations of Neurosurgery Societies; **VAS:** visual analogue scale

DISCUSSION

Headache can develop over a variety of regions of the head. Approximately half of the adult population worldwide suffers from headache. It was reported that 95% of females and 91% of males suffered from headaches within the last year, nevertheless, 18% of females and 15% of males consulted a physician for headaches(8). Acute headache is the presenting symptom in 2-4% of the patients evaluated at the ED. The incidence of spontaneous SAH among patients presenting with acute headache is 1%(2). General incidence for SAH is 7.8/100 000 (9). The ratio of SAH patients who presented to the ED with normal neurological examination in this study is approximately one-tenth of spontaneous SAH incidence. We suppose that the reason for this comparably lower ratio with regard to literature is due to exclusion of patients with chronic headache and trauma or positive neurological findings. This rate is a very low rate but very important knowledge for taking into consideration when we make quick decisions in the ED. Due to the fact that this decision may cause irreversible and undesirable results.

The majority of the patients with acute headache who present to the ED are suffering from primary headaches such as migraine, tension-type headache and cluster headache. Secondary headaches can be caused by various organic disorders ranging from sinusitis to SAH(10). We classified the headache patients in this study according to the ICHD criteria by IHS. These criteria list 'Headache attributed to SAH under 'Severe headache of sudden onset'(7). This headache has been reported to be the first or worst ever headache by many patients (11,12). It is also known that there may be no other symptoms accompanying the headache(7). However, the initiation and form of SAH pain are not clear in the literature. The point of greatest concern for most patients with acute headache who presented to the emergency service in our study and their physician was whether the patient had a brain hemorrhage. It is difficult to diagnose early SAH patients who present with headache as the sole symptom and normal neurological findings. It would of course be difficult, time-consuming and inappropriate to request investigations for all headache patients that present to the ED.

The major symptom in approximately 75-80% of SAH patients is headache. Other symptoms are vomiting, photophobia, neck stiffness, various levels of loss of consciousness, acute confusion, agitation and restlessness while the physical examination can reveal focal neurological deficit, nuchal rigidity, retinal hemorrhage, cranial nerve palsy and hemiplegia. The presence of these symptoms and signs strongly supports a SAH diagnosis. However, the lack of

these symptoms does not necessarily mean another diagnosis. Misdiagnosis of headache rate is from 12–25%, misdiagnosis include not considering the full spectrum of presentations, not following an algorithmic workup(13). It may not be possible to diagnose SAH when there are no classical clinical signs or symptoms as can be seen in up to 50% of the patients at the first visit to the physician with the most common diagnoses being migraine and tension-type headache(14). Intraventricular or intracerebral hemorrhage can also cause acute headache but focal neurological deficits usually develop. Carotid and vertebralbasilar artery dissection signs can emerge suddenly as head, neck and face pain. Meningoencephalitis can also cause a severe headache with sudden onset. These infections are accompanied by fever, rash, and septic signs that emerge in time. Intracranial venous thrombosis can appear with the sudden onset of headache, loss of consciousness and even with coma. SAH can sometimes cause fever, leading to an incorrect diagnosis of meningitis. Cardiac arrhythmia can develop in about 20% of SAH patients and ischemic changes can be seen on the ECG, leading to an incorrect diagnosis of heart disease. Vomiting attacks can also occur with SAH and can be confused with gastrointestinal disorders. Additionally, a headache developing after exertion in a patient over 50 years of age can be due to an intracranial hemorrhage or carotid artery dissection(15). Our decision is vital for the patient and we should therefore use a sequenced algorithm to approach these patients presenting with acute headache. The headache of SAH patients has no characteristic features and can therefore be confused with other disorders. Some subjective warning headache features were observed in this study. Our patients who had SAH with normal neurological examination stated that the headache had spread all over the head but had become more severe in the neck and some patients felt like they were being stabbed in the neck. Some patients also felt pressure as though their heads could explode any minute and stated having difficulty speaking because of the pain. The physical examination revealed a scared facial expression and restless mood. These symptoms are early diagnostic findings for SAH in this study. However, these observed symptoms are not certainly markers. Headache sometimes develops very quickly and even within seconds but can also increase gradually within minutes and sometimes be confused with benign headache(13).

In SAH patients with a normal level of consciousness and no neurological signs, neck stiffness is the only diagnostic clue at neurological examination. But our SAH patients had no neck stiffness when they arrived to the emergency

department. When a cerebral aneurysm ruptures, blood flows into the subarachnoid space. Blood is very irritating to meninges. The meningeal irritation symptoms occur approximately 6-24 hours after SAH (16). Neck stiffness at neurologic examination isn't seen in some SAH patients within the initial hours after symptom onset. The patients with SAH who presented in this study apply to emergency department in the initial 2 hours. For this reason we thought these patients did not have neck stiffness initially. However, all 8 SAH patients showed neck stiffness after about 4-6 hours from presenting to an emergency service. We want to emphasize by this study that patients who have SAH may present to the emergency service with normal neurological examines at initial hours of SAH.

Cranial CT was requested for 1434 (7.7%) of our patients with a severe headache of sudden onset which we thought could be a secondary headache and who had a VAS score of 7 and above. A pathology was found in 96 (7.8%) of the patients who had a tomography performed. Subarachnoid hemorrhage was found in 8 of these patients. The diagnosis was made with tomography in all SAH patients in our study. The tomography may be normal in 10% of SAH patients(17,18). If the CT is normal but the suspicion continues, a lumbar puncture may be diagnostic. Other pathologies on cerebral CT in our patients with headache but normal neurological findings were CVO in 53 patients (0.27%), intraparenchymal hemorrhage in 18 patients (0.09%), subdural hematoma in 5 patients (0.03%), and intracranial mass in 12 patients (0.06%). The rate of patients with an intracranial mass to present to an outpatients department only with headache was reported as 8.2% (19). The authors of that study have emphasized that headaches lasting longer than 10 weeks should be investigated in terms of an intracranial neoplasm. Frisberg et al evaluated 897 migraine patients with normal neurological findings using imaging and found 3 intracranial tumors and one arteriovenous malformation(20).

The high rebleeding rates emphasize the importance of early diagnosis and treatment. When patients with aneurysmal SAH present to the hospital for the first time, there is a high risk of rebleeding and acute decompensation later on even when there is no neurological deficit at first(21). The mortality rate after SAH is 33% on the first day, 27-43% in the first week, and 49-56% in the first month(22,23,24). Because of high mortality and morbidity rate, diagnosis time of SAH is very important for patients who come to emergency department. The margin of error can increase to 50% with such patients, especially when the physician is in a busy working environment and has to decide quickly(14). This study is initial investigation

between early time of spontaneous subarachnoid hemorrhage and its symptoms. It should be developed by multicenter studies and higher patients number.

CONCLUSION

The inability to properly manage an acute headache could mean overlooking an underlying subarachnoid hemorrhage and end in death. The presence of neurological findings decreases such errors but headache can be the only symptom with no neurological signs in certain SAH cases. Patients who state their sudden, severe, acute onset headache should be investigated carefully(11,12,18). The patients should be followed-up in case of any suspicion, and diagnostic and imaging investigations should be performed. This study showed that patients who have SAH may present emergency service with normal neurological examination in initial hours of SAH.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Ethics Committee Approval: Consent was obtained from Dışkapı Yıldırım Beyazıt Ethics Committee.

Author Contributions: Conception/Design of Study- A.Y. ; Data Acquisition- A.Y.; Drafting Manuscript- Y.G. ; Critical Revision of Manuscript- Y.G. ; Final Approval and Accountability- A.Y. ; Supervision- Y.G.

REFERENCES

1. Stovner LJ, Hagen K, Jensen R, et al. The global burden of headache: a documentation of headache prevalence and disability worldwide. *Cephalalgia*. 2007;27(3):193-210.
2. Ramirez-Lassepas M, Espinosa CE, Cicero JJ, Johnston KL, Cipolle RJ, Barber DL. Predictors of intracranial pathologic findings in patients who seek emergency care because of headache. *Arch Neurol* 1997;54:1506-9.
3. Goldstein JN, Camargo CA Jr, Pelletier AJ, Edlow JA. Headache in United States emergency departments: demographics, work-up and frequency of pathological diagnoses. *Cephalalgia* 2006;26(6):684-90.
4. Bigal M, Bordini CA, Speciali JG. Headache in an emergency room in Brazil. *Sao Paulo Med J* 2000;118(3):58-62.
5. Luda E, Comitangelo R, Sicuro L. The symptom of headache in emergency departments. The experience of a neurology emergency department. *Ital J Neurol Sci* 1995;16(5):295-301.
6. Edlow JA, Caplan LR: Avoiding pitfalls in the diagnosis of subarachnoid hemorrhage. *N Engl J Med* 342: 29-36, 2000
7. Headache Classification Committee of the International

Headache Society (IHS) , The International Classification of Headache Disorders, 3rd edition (beta version) Cephalalgia 2013;33(9) 629–808.

8. Linet MS, Stewart WF, Celentano DD, Ziegler D, Sprecher M. An epidemiologic study of headache among adolescents and young adults. JAMA 1989;261:2211-6.

9. Koivisto T, Vanninen R, Hurskainen H, Saari T, Hernesniemi J, Vapalahti M. Outcomes of early endovascular versus surgical treatment of ruptured cerebral aneurysms A prospective randomized study. Stroke. 2000;31:2369–77.

10. Classification and diagnostic criteria for headache disorders, cranial neuralgias and facial pain. Headache Classification Committee of the International Headache Society. Cephalalgia 1988;8 (suppl 7):1-96.

11. Morgenstern LB, Luna-Gonzalez H, Huber JC, et al. Worst headache and subarachnoid hemorrhage: prospective, modern computed tomography and spinal fluid analysis. Ann Emerg Med 1998;32(3 pt 1): 297-304.

12. Evans RW. Diagnostic testing for the evaluation of headaches. Neurol Clin 1996;14:1-26.

13. J. A. Edlow and L. R. Caplan, "Avoiding pitfalls in the diagnosis of subarachnoid hemorrhage," The New England Journal of Medicine, vol. 342, no. 1, pp. 29–36, 2000.

14. Edlon JA, Caplan LR. Avoiding pitfalls in the diagnosis of subarachnoid hemorrhage. N Eng J Med 2000;342:29-36.

15. Rothman RE, Keyl PM, McArthur JC, Beauchamp NJ Jr, Danyluk T, Kelen GD. A decision guideline for emergency department utilization of non-contrast head computed tomography in HIV-infected patients. Acad Emerg Med. 1999;6(10):1010-1019.

16. McDonald RL, Weir B: Perioperative Management of Subarachnoid Hemorrhage. Youmans Fifth edition, Vol II, Philadelphia, Elsevier 1996; 1813-38.

17. (15) Schull MJ. Headache and facial pain. In: Tintinalli JE, Kelen GD, Stapczynski JS, editors. Emergency medicine: a comprehensive study guide. Toronto (ON): McGraw-Hill; 2000:1422-302.

18. van der Wee N, Rinkel GJE, Hasan D, van Gijn J. Detection of subarachnoid haemorrhage on early CT: Is lumbar puncture still needed after a negative scan? J Neurol Neurosurg Psychiatry 1995;58:357-9.

19. Vazquez-Barquero A, Ibanes FJ, Herrera S, Izquierdo JM, Berciano J, Pascual J. Isolated headache as the presenting clinical manifestation of intracranial tumors: a prospective study. Cephalalgia 1994; 14:270-272.

20. Frishberg BM. The utility of neuroimaging in the evaluation of headache in patients with normal neurologic examinations. Neurology 1994; 44:1191-1197.

21. Yo-EI S. Ju and Todd J. Schwedt , Abrupt-Onset Severe Headaches Semin Neurol . 2010 April ;30(2): 192–200.

22. Locksley HB. Natural history of subarachnoid hemorrhage, intracranial aneurysms and arteriovenous malformations. Based on 6368 cases in the cooperative study. J Neurosurg 1966;25:219–239.

23. Locksley HB. Natural history of subarachnoid hemorrhage, intracranial aneurysms and arteriovenous malformations. J Neurosurg 1966;25:321–368.

24. Pakarinen S. Incidence, aetiology, and prognosis of primary subarachnoid haemorrhage. A study based on 589 cases diagnosed in a defined urban population during a defined period. Acta Neurol Scand 1967;43(Suppl 29):1–28.